



Transition of Research into Medical Practice

J.D. Polk, DO, MS, CPE, FACOEP
Chief, Space Medicine Division

Kathy A. Johnson-Throop, PhD
Medical Informatics & Healthcare Systems Branch
NASA Johnson Space Center



Transition to Operations (TtO) Process

Research

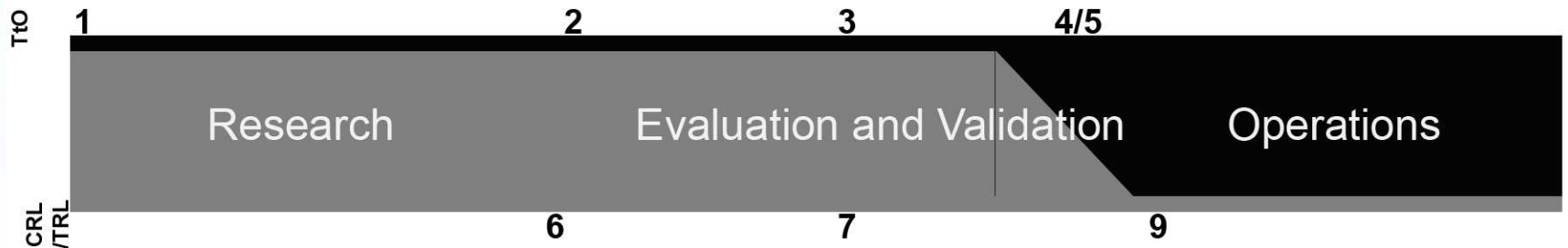
Evaluation and Validation

Operations

- Objectives
 - Apply best practices for space exploration
 - Evaluate the effectiveness and operational readiness of human health-related research and technology products and deliverables
 - medical research and technology products and deliverables
 - environmental factors research and technology products
 - human factors & habitability research and technology products
 - Support Agency human space flight programs
- Scope: newly proposed health and medically related procedures, practices, processes, countermeasures, or technologies.



Transition to Operations Steps



1. Description of deliverable/product
 - detailed description
 - intended use or application
 - how it addresses a NASA identified critical risk, medical issue, or application
2. Data required to demonstrate efficacy, effectiveness, or utility of deliverable/product
3. Data required to demonstrate the operational validation of the deliverable or product
4. Implementation plan to describe the product/deliverable use or application (e.g. protocol, dosing regime, scope of use, etc.).
5. Analysis of mission resources required for product/deliverable implementation (e.g. crew time, volume, power, etc.)



Bone QCT Example

- ✓ TtO1: DEXA scans provide an assessment of bone density, but does not capture sufficient information to assess risk of fracture.
- ✓ TtO2: Ground studies showed Bone QCT is an indicator of bone strength; showed that strength is regained along the axes of bone that bear load, but not along the less loaded axes. Fracture risk increases for some situations (unquantifiable increase).
- ✓ TtO3: Flight study verified ground-based results.
- TtO4/5: QCT may become a medical requirement.
- Note, the quantification of the increased risk of fracture remains unknown. *This aspect is still a research question.*



Actigraphy Example

- ✓ TtO1: Crews sleep poorly in space and this has the potential to affect their ability to work. How do we assess this?
- ✓ TtO2: Terrestrial medicine uses actigraphy to diagnose sleep disorders and as an outcome measure for treatment.
- TtO3: Flight study in progress. Results thus far show that in-flight data can be used in a similar way..
- ❑ TtO4/5: Actigraphy may become an assessment technique used by flight surgeons to determine sleep quality and treatment effectiveness.

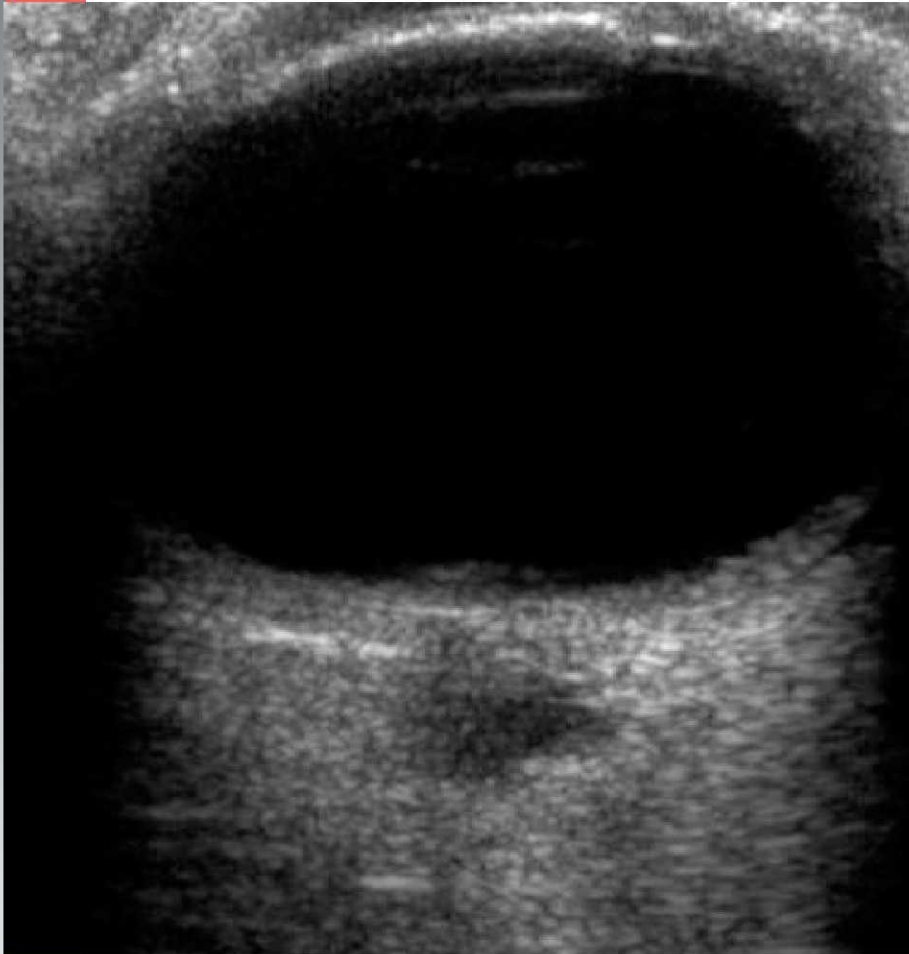


Potassium Citrate Example

- ✓ TtO1: Kidney Stones are a risk .
- ✓ TtO2: Ground studies showed . . .
- ✓ TtO3: Flight study verified ground-based results.
- TtO4/5: Potassium Citrate may become a countermeasure used to lessen the risk of kidney stone formation.



Ultrasound



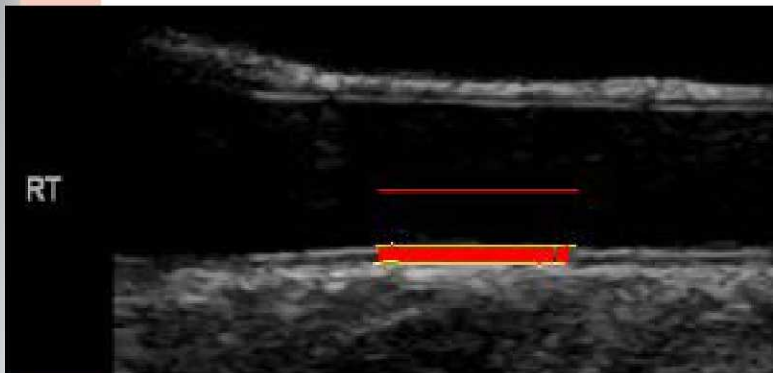
- New uses for ultrasound
- New protocols for ultrasound
- New techniques in remote and telemedicine uses of ultrasound



Transition to Clinical Practice



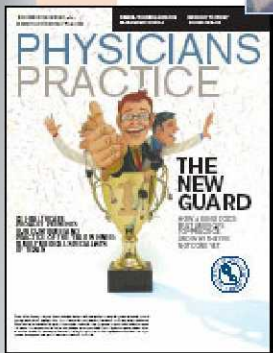
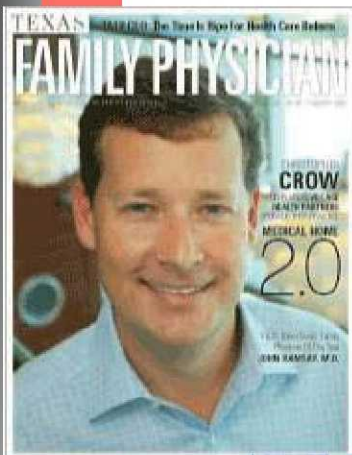
- JPL software used to study subpixel images of planets (can distinguish 256 shades of gray at the micro pixel level).
- Tech used from Carotid Intima-Medial Thickness ultrasound to evaluate plaque.
- Clinical Practice Guidelines from Cardiology consultants.



Arteriovision CIMT
Feb 2010 Polk



Transition to Mindset



Your Health is Our Mission



Transition to Access



Global
Standardized
Medical
Records
Access
Using the
“Cloud”

Photo by google.com

Your Health is Our Mission



Transition to Operations Thru Innovation

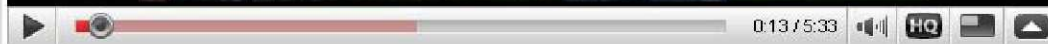
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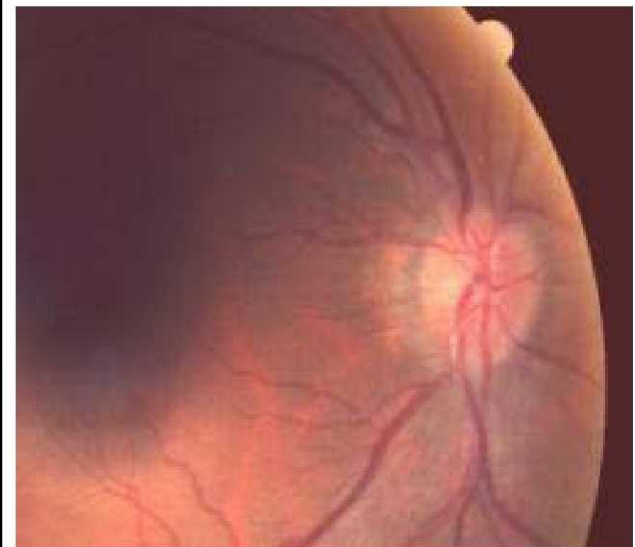
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Your Health is Our Mission



Transition to Quality

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Continental





Summary

Research

Evaluation and Validation

Operations

- Keys to Success
 - Ground research in operational need
 - Research product must have a clear use
- Transition requires rich communication between research and operational personnel
- It's about more than spaceflight hardware or treatments in orbit.
- It's about any process, change, or improvement that either enables our mission, gains knowledge, or translates back to Earth.
- We are about making spaceflight safe for the astronaut's lifetime,...not just during the flight.